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THE AGE AND GROWTH OF CATFISH *RITA RITA* (HAM.) FROM THE RIVER YAMUNA IN NORTH INDIA

N. TAMUBI DEVI*, M.S. SIDDIQUI AND S. ANWAR**
Department of Zoology, Aligarh Muslim University, Aligarh - 202 002

ABSTRACT

The age of 224 fishes was determined by counting the translucent zone on the opercular bones and otoliths. Back calculated annual growth of the fish revealed that the absolute growth of the female was better than that of the male upto the 3rd year. From the 4th year onwards the growth of the male exceeded the growth of the female.

INTRODUCTION

Earlier investigations on the age and growth of catfish were undertaken using length frequency distribution polygon by Bhatt (1970). Subsequently Anwar (1985) investigated the age and growth of *Wallago attu* and *Mystus seenghala* using opercular bones and otoliths as indicators of age. Saxena (1964) gave a brief account of a technique of photographing centra of small vertebrae as an aid to decipher the age of *Rita rita*. Lal and Dwevedi (1965) dealt with length-weight relationship of *R. rita* briefly. However, the literature on the age and growth of *R. rita* is scanty. Therefore, the present investigation deals with the relationship between opercular bone and body length, maximum size and age, and length-weight relationship of the fish from the river Yamuna.

MATERIAL AND METHODS

The samples for the present investigation comprised 224 fish from river Yamuna, of the size range between 149 mm and 437 mm collected from Aligarh fish market from January to December 1986. The total length of each fish was measured to the nearest millimeter from the tip of the snout to the longest ray in the caudal fin on the fish measuring board. Each fish was weighed on a balance sensitive upto 0.1 g. Sex of the fish was determined by examination of squash preparation of the gonad under a microscope.

The opercular bones and otoliths of each fish were removed to determine the age of the fish. The otoliths were kept in small envelops and each envelop was labelled serially. The opercular bones were boiled in 10% potassium hydroxide solution to clean the muscles. Well dried opercular bones were examined under binocular microscope by placing it against a black back-ground under reflected light to determine the age of the fish.

The opercular bones were measured at right angles to a perpendicular line passing through the ossification point. Thus measurements were taken with the help of a scale from the ossification point to the margin of the operculum. The measurements were also taken from the ossification point to the point of termination of the translucent zone for radii at each annulus to back calculate the length of the fish at various annuli.

The length attained by the fish at the time of formation of various annuli were back calculated from the opercular bone of each fish. The back calculation was done by using the Lee's formula (1920) which was modified on the assumption that operculum growth is directly proportional to the body length of the fish.

$$L_1 = \frac{S_1 \times L}{S}$$

Where, L_1 = length of the fish at the time of annulus formation, L = total length of the fish,

*S. Kulla College, Nambol, P.O. Nambol, Manipur
** J.N. Medical College, Aligarh Muslim University, Aligarh - 202 002.

S_1 = distance between the ossification point and each annulus of the opercular bone. and S = total length of the opercular bone from the ossification point upto the edge of the bone.

The convex surface of each otolith was ground by hand on a fine carborandum stone on which there was a little dilute hydrochloric acid. The otoliths were periodically examined under a binocular microscope to check the appearance of the growth rings. When the growth rings were visible, the otoliths were put into the water to remove the acid then transferred to absolute alcohal for 1 to 3 minutes and finally kept in medicinal creosote solution for about 24 hours. Subsequently the otoliths were examined under a binocular microscope to verify the age readings taken by opercular bones.

Length-weight relationship of the fish of both sexes was determined as described by Le Cren (1951). Coefficient of correlation between length and weight of the fish was also calculated.

RESULTS AND DISCUSSION

Fig. 1 shows relationship between the body length and opercular bone length of the fish. The equation of regression of opercular length to total length of the fish reveals a straight line relationship. The equations are as follows :

$Y = 2.3355 + 0.03071\ x$ (female)

$Y = 1.6166 + 0.3288\ x$ (male)

Where, x is the total length of the fish Y is the length of the opercular bone.

The values of correlation coefficient, r = 0.9449 and r = 0.9561 calculated for males and females respectively, indicated a significant correlation between the two variables. It was observed that the fish length increment was directly proportional to the opercular length (Fig. 1).

The age of the fish, determined by opercular bones and otoliths as opaque and translucent zones were clearly visible. The translucent zone is considered to be an annual mark. Plates I and II reveal a number of translucent

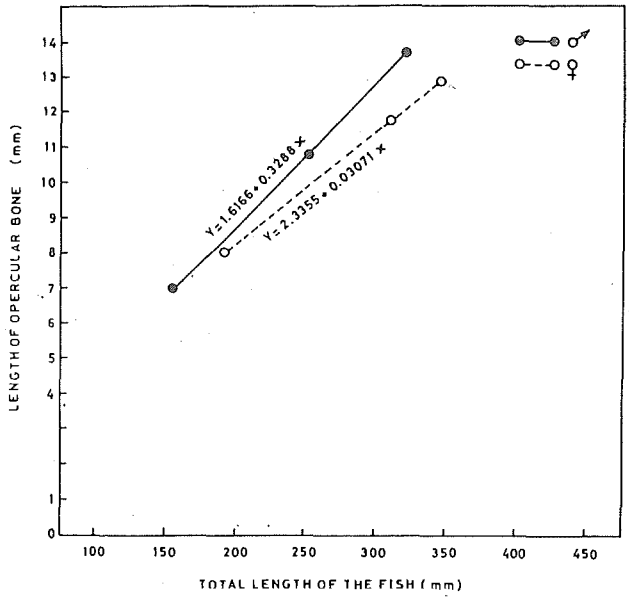
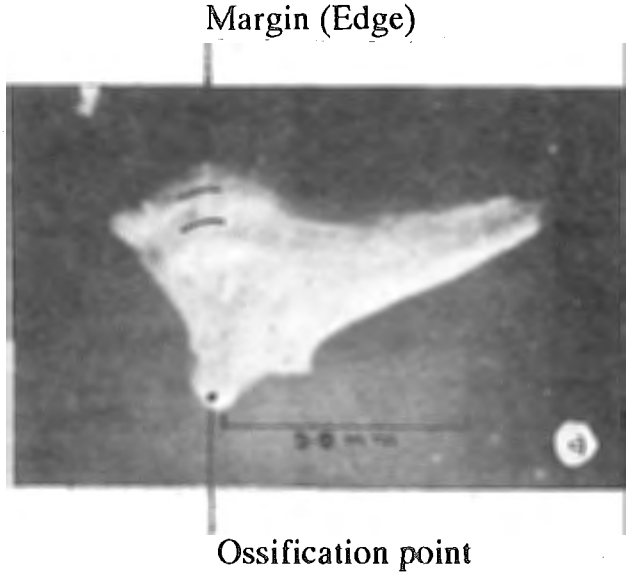


Fig. 1. *Regression of opercular bone against total length of R. rita.*



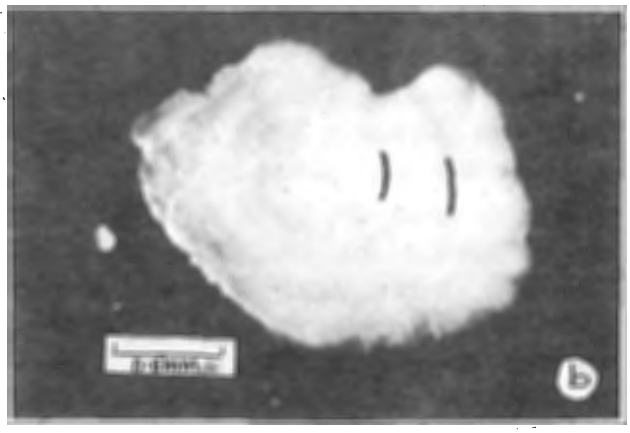


Plate I

Plate I. *(a) opercular bone and (b) otolith showing 2 annuli. Length of the fish -223 mm, sex - male, date of capture - 7-4-1986*

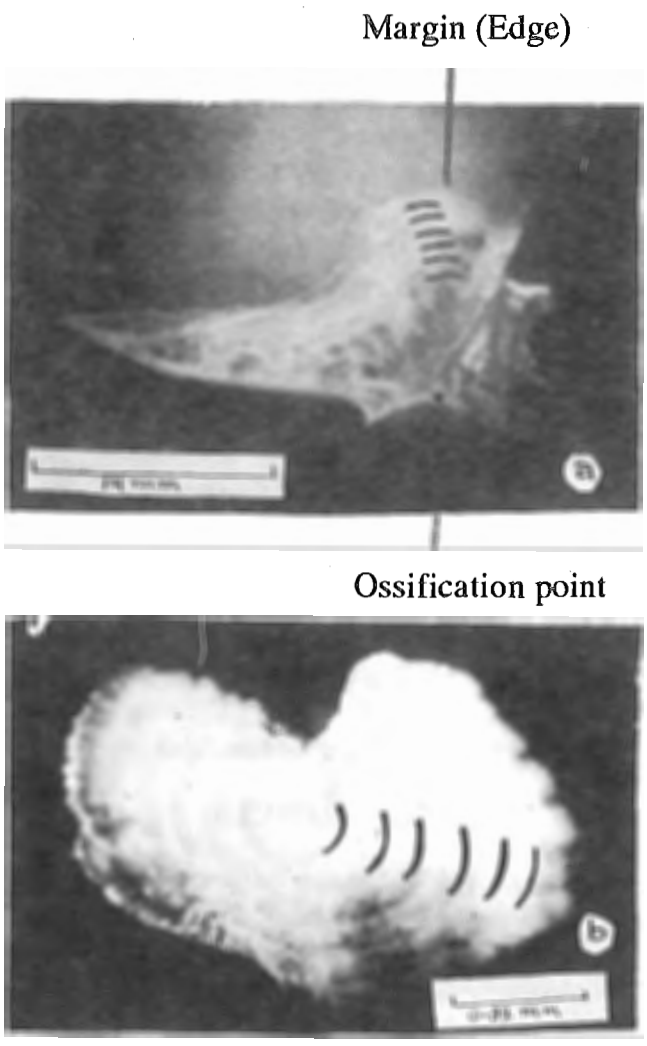


Plate II

Plate II. *(a) opercular bone and (b) otolith showing 6 annuli. Length of the fish - 375 mm, sex - female, date of capture - 25-10-1986*

zones on the opercular bone and otolith of the fish of different age groups. The age of the fish was determined by counting the number of translucent zones on the opercular bones and the otoliths. The annual length of each fish for different age groups was backcalculated using opercular bone annuli. The opercular bones were larger than the otoliths. Therefore it was found easier to back- calculate the length of fish for different age groups using opercular bones.

The otolith of *R. rita* used for determination of age revealed actual length of the fish. Back-calculated lengths were not used here for otolith method. There was a small opaque nucleus surrounded by broad opaque zone followed by a narrow translucent zone. The translucent zone formed when the body growth was negligible (Tesch, 1971).

The mean length of *R. rita* for different age groups showed that there was a difference in the mean length for age between males and females (Fig. 2). The males were found to attain a length of 149 mm, 202 mm, 254 mm,

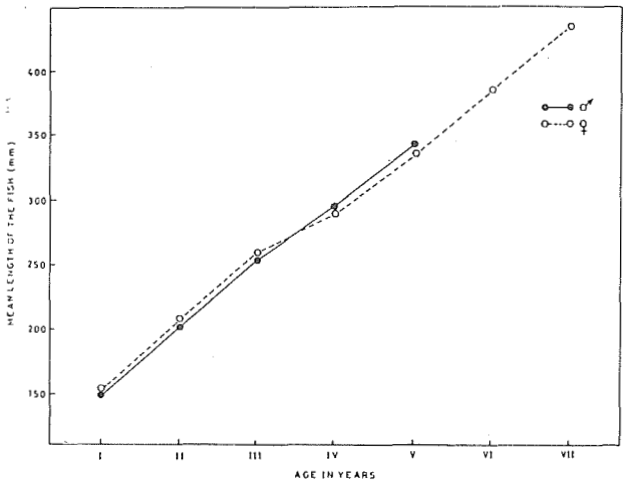


Fig 2. *Calculated mean length for age of male and female R. rita.*

294 mm and 341 mm for 1, 2, 3, 4 and 5 years of life respectively. The females were found to attain the length of 153 mm, 207 mm, 258 mm, 290 mm, 333 mm, 384 mm and 437 mm at the end of 1, 2, 3, 4, 5, 6 and 7 years of life respectively. The absolute growth of a female was better than that of a male upto 3 years. From the 4th year onwards the growth of the male exceeded that of female. Similar phenomenon of variation in the absolute growth between male and female was also observed in the catfish *Wallago attu* by Anwar and Siddiqui (1989). They explained that the subsequent fall in the growth of a female was a result of spawning stress. The same may be true for *R. rita* which spawn during the 3rd year of life and subsequently there was a gradual increase in the fecundity of the fish with the increasing age (Devi, 1987). Therefore, the growth potential in a female is directed more towards gonad building than to body increment as compared to males. Therefore, it is obvious that in the early part of the life, the males reveal better absolute growth than females. The apparent spawning stress is reflected in the body growth of females from the 4th year onwards.

Length-weight relationship provides a measure to convert the length into weight and vice-versa. Such a relationship also provides information on the well being of the fish and variation in growth. The cube Law is based on the assumption that the weight is a volume function and length is a linear function and the weight of the fish is roughly equal to the cube of the length. Fig. 3 shows the

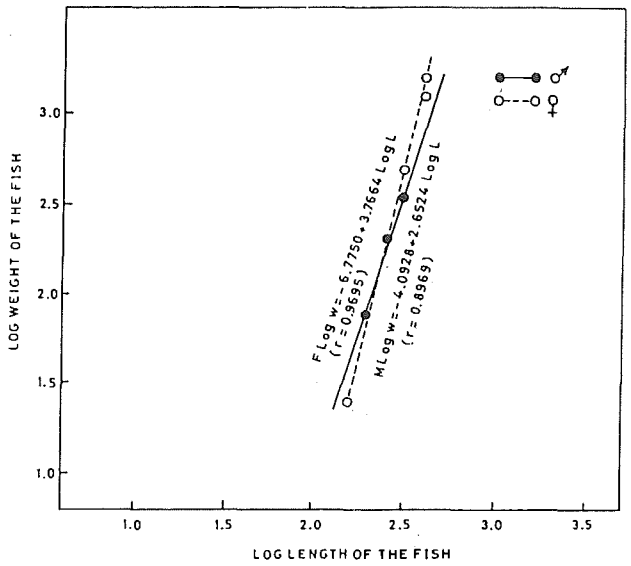


Fig 3. *Length-weight relationship of male and female R. rita.*

logarithmic values of the length and weight. The regression of the log weight on log length was calculated by least square method and separate equations for males and females are as follows along with the values of coefficient of correlation (r).

$$\text{Log } W = -4.0928+2.6524 \text{ Log } L♂ (r = 0.8969)$$

$$\text{Log } W = -6.7750+3.7664 \text{ Log } L♀ (r = 0.9695)$$

There was a high degree of correlation between the two variables of both the sexes. The value of the slope 'n' for the male was 2.6 which is less than 3, while the value of 'n' for the female was 3.7, which is more than 3. Thus, it may be concluded that the weight increment of the female was more than that of the male. It was evident from the data that females were robust as compared to males of the same age. This variation may be as a result of gonad development. Further, it may be pointed out that the females were heavier than males in smaller sized fishes while the males were heavier than females in the large sized fishes. This phenomenon was also observed in some carps by Chakraborty and Singh (1963). The length-weight curve of females lies above the length-weight curve of male upto the length of about 300 mm and beneath the length-weight curve of females in *R. rita.* The point of intersection approximately around 300 mm also represented the size of the fish at first maturity (Oslen and Marriman, 1946).

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REFERENCES

Anwar, S. 1985. Studies on the predation and growth of some catfishes from the river Kali with reference to its bottom fauna. *Ph.D. Thesis, Aligarh Muslim University, Aligarh.*

Anwar, S. and Siddiqui, M.S. 1989. The age and growth of the catfish, *Wallago attu* (Bloch & Schneider) of the river Kali in North India. *J. Freshwater biol.* 1 (1) : 83-89.

Bhatt, V.S. 1970. Studies on the biology of some freshwater fishes Part IV. *Mystus seenghala* (Sykes). *J. Bombay nat. His. Soc.* 67 (2) : 194-211.

Chakraborty, R.D. and Singh, S.B. 1963. Observations on some aspects of the fishery and biology of the Mrigal. *Indian J. Fish.* 10 : 203-232.

Devi, N.T. 1987. The Biology of the catfish *Rita rita* (Ham.) of the riverine waters in North India. *M.Phil. Thesis, Aligarh Muslim University, Aligarh.*

Lal, M. S., and Dwevedi, A.S. 1965. Studies on the biology and fishery of some freshwater fishes of U.P. Length-weight relationship of *Rita rita. Ichthyologica.* 4 (1-2) : 22-27.

Le Cren, E.D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the Perch *(Perca fluviatilis). J. Anim. Ecol.* 20 : 201-209.

Lee, R.M. 1920. A review of the methods of age and growth determination in fishes by means of scales . *Fishery Invest. London* 4 (2) : 32 p.

Oslen, Y.H. and Marriman, D. 1946. Studies on the marine resources of southern New England IV. The biology and the economic importance of the Ocean Pout, *Macrozoarces americanus* (Bloch and Schneider) *Bull. Bingham Oceanogr. Coll.* : 91-184.

Saxena, R.K. 1964. A Technique of photographing small vertebrae centra as an aid to decipher the age of *R. rita. Sci. & Cult.,* 30 : 204-5.

Tesch, F.W. 1971. Age and growth. In *Methods for assessment of fish production in freshwaters* 2nd ed. (Ed. W.E. Ricker) IBP Hand Book (3) Oxford : Blackwell Scientific Publications. 348 pp.